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## 6. OTHER NON-DIETARY INGESTION FACTORS

### 6.1 INTRODUCTION

Young children (i.e., ages 6 months through approximately 4 years) also have the potential for exposure to toxic substances through non-dietary ingestion pathways other than soil ingestion (e.g., ingesting pesticide residues that have been transferred from treated surfaces to the hands or objects that are mouthed). These children have an urge to mouth objects or their fingers in exploring their environment, as a sucking reflex, and as a habit (Groot et al., 1998). This route of exposure may exceed other routes ingestion (i.e., food, pica, drinking water, breast milk) and dermal exposure because non-dietary ingestion may result in higher ingestion rates of contaminated material (Weaver et al., 1998). This exposure route is also a difficult route to model because there is little literature or research that has been performed on mouthing behavior (Reed et al., 1998) and little information on the susceptibility of children to toxic substances (Weaver et al., 1998).

Mouthing behavior includes all activities in which objects, including fingers, are touched by the mouth or put into the mouth except for eating and drinking, and includes licking, sucking, chewing, and biting (Groot et al., 1998). This exposure route becomes difficult to model because contact with surfaces is intermittent and nonuniform over different parts of the body. The intermittent and nonuniform nature of the mouthing itself also makes this pathway difficult to model (Zartarian et al., 1997).

Children exhibit large differences in mouthing behavior (Groot et al., 1998). Infants are born with a sucking reflex for breast feeding, and within a few months, children begin to use sucking or mouthing as a means to explore their surroundings. Children will use both sucking and licking to explore their environment. Sucking also becomes a means of comforting a child when they are tired or upset. In addition, teething normally causes substantial mouthing behavior, sucking or chewing, to alleviate discomfort in their gums. Each child is different, and large differences occur between children, even within the same family.

Where mouthing becomes critical in exposure to potentially toxic substances is the proximity and behavior of a small child around potentially contaminated sources. Children play close to the ground and are constantly licking their fingers or mouthing toys or objects. As a result, this becomes a potentially significant exposure route for children. They can ingest more

toxic constituents through this behavior than from dietary ingestion or inhalation because the children could place wet, sticky fingers on potentially-contaminated surfaces where more toxic constituents may adhere to the fingers than if the fingers were dry (Gurunathan et al., 1998).

Gurunathan et al. (1998) estimate that young children spend as much as 90 percent of their days inside, so exposure to contaminants that may infiltrate the home (i.e., volatile and semi-volatile organic constituents [VOCs and SVOCs]) through the vapor phase may be of concern. This may be a significant pathway of exposure to SVOCs because these compounds can be deposited on surfaces in the home or become absorbed onto plastic toys or in stuffed animals where they can serve as reservoirs for toxic constituents (Gurunathan et al., 1998).

There have been few studies investigating this potential exposure route. The shortage of research and data may be due to the difficulty in observing very young children and the labor-intensive effort in gathering the data (U.S. EPA, 1999). The applicable research efforts use two general approaches to gather data: real-time hand recording in which trained persons observe a child and manually record information on a survey sheet or score sheet; or, videotaping in which trained videographers tape a child's activities and subsequently extract the pertinent data manually or with computer software (U.S. EPA, 1999).

Some researchers express mouthing behavior in terms of frequency of occurrence (e.g., contacts/hour, contacts/minute). Others, express mouthing behavior as a rate in units of minutes per hour of mouthing time. Both approaches have their use in exposure assessments. The former approach is more appropriate when studying children's behavior during various microactivities. The latter, however, is more useful when studying children's behavior during macroactivities. Macroactivities can be described by a child's general activities such as sleeping, watching television, playing, and eating. Microactivities refer to the specific behavior a child is engaged in such as hand-to-surface contacts and hand-to-mouth behavior (Hubal, 2000). Time spent in various macroactivities in several microenvironments (e.g., indoors at home) are presented in Chapter 9).

## **6.2 STUDIES RELATED TO NON-DIETARY INGESTION**

*Groot et al. (1998) - Mouthing Behavior of Young Children* - In this study, Groot et al. (1998) examined the mouthing behavior of infants and young children between the ages of 3 and 36 months in the Netherlands. The study was actually part of a larger effort to determine if PVC

1 toys softened with phthalates could pose health risks to children from mouthing. As part of the  
2 effort, Groot et al. (1998) asked parents to observe their children and gather information which  
3 could be used to estimate how often children engage in mouthing and the duration spent mouthing  
4 during a day. Parents were asked to observe their children ten times per day for 15-minute  
5 intervals (i.e., 150 minutes total per day) for two days and measure mouthing with a stopwatch.

6 In total, 36 parents participated in the study and 42 children were observed by their  
7 parents. For the study, a distinction was made to differentiate between toys meant for mouthing  
8 (e.g., pacifiers, teething rings) and those not meant for mouthing. The time a child spent  
9 mouthing a dummy (e.g., pacifier) was not included in the time recorded. Although the sample  
10 size was relatively small, the results provide a first-order estimate on mouthing times during a day.  
11 Table 6-1 compiles the mouthing times from the Groot et al. (1998) effort. The results show  
12 wide variation. The standard deviation in all four age categories except the 3- to 6-month old  
13 children exceeds the mean time estimated mouthing during a day. The large standard deviations is  
14 not unexpected given the vast behavioral differences from child to child and the small sample size  
15 of the study. The overall trend of the data, however, may be accurate in that it shows that as the  
16 children age, the time spent mouthing decreases. The 3- to 6-month children were estimated to  
17 mouth 37 minutes per day and the 6- to 12-month children 44 minutes per day. After 12 months,  
18 the estimated mouthing time drops quickly to 16 minutes per day for 12- to 18-month children  
19 and 9 minutes per day for 18- to 36-month children.

20 The study has several limitations that have an impact on the usability of the data. The  
21 initial drawback concerns the small size of the study. Groot et al. (1998) acknowledge this  
22 shortcoming and recommend further study using a larger sample population. In addition, the  
23 study also incorporated mostly higher-educated persons. The area where the study was  
24 performed consisted primarily of parents with higher education. The study had recruited persons  
25 of lower education and socioeconomic levels, but these persons chose not to participate in the  
26 study after recruitment (Groot et al., 1998). Therefore, the results do not reflect data from the  
27 full spectrum of the population. The study also recorded only the time spent mouthing and not  
28 the number of times that mouthing occurred and did not differentiate the types of objects  
29 mouthed. In addition, children were observed for a period of two consecutive days and may not  
30 reflect long-term behavior. The study may not be representative of the U.S. population.

1            *Reed et al. (1999) - Quantification of Children's Hand and Mouthing Activities through*  
2            *a Videotaping Methodology* - In this study, Reed et al. (1999) used videotaping to quantify the  
3            frequency and type of contacts children have during the course of an hour. The contacts included  
4            numerous categories: hand to clothing, hand to dirt, hand to hand, hand to mouth, hand to object,  
5            object to mouth, hand to smooth surface (e.g., counter tops, table tops), hand to textured surface  
6            (e.g., stuffed animal) (Reed et al., 1999). A total of 30 children were observed in this study.  
7            Children were observed in both day care (20 children 3-6 years old) and residential (10 children 2-  
8            5 years old) settings. Parents and day-care providers were also asked to complete questionnaires  
9            describing the behavior of their children. In addition, the study also differentiated between the  
10           usage of right and left hands.

11           Over the course of the research, Reed et al. (1999) found that the behavior of children was  
12           similar between the day and residential settings except for the contact rate of hand to smooth  
13           surfaces. Children in residential settings had higher contact rates with smooth surfaces than  
14           children in day care centers. The results of the study are compiled in Table 6-2. The highest  
15           contacts were with object (123 contacts/hr), smooth surfaces (84 contacts/hr), and other (83  
16           contacts/hr). The two lowest contact rates were the hand-to-mouth (9.5 contacts/hr) and object-  
17           to-mouth (16.3 contacts/hr) (Reed et al., 1999). Because the contact rates of hand-to-objects and  
18           smooth surfaces are high, these results indicate that the fingers would appear to provide a  
19           continual dose per hand-to-mouth contact because of constant touching of potentially  
20           contaminated surfaces. Pesticides and other SVOCs are partitioned between the vapor and  
21           deposited phases (e.g., on dust or absorbed on a plastic toy or stuffed animal) such that a child's  
22           fingers, especially if wet from mouthing, will continually be acquiring doses of these types of  
23           constituents (Gurunathan et al., 1998). Reed et al. (1999) also noted that children acted equally  
24           on their environment with both hands with the exception of object-to-mouth behavior. Therefore,  
25           the compiled data are reported as combined right and left hand data. The object-to-mouth  
26           behavior showed a strong preference for the right hand over the left hand for nearly all children  
27           (Reed et al., 1999). The preference ratio for the right hand over the left hand for this category  
28           was 6.8 to 1 (Reed et al., 1999).

29           The advantages of the Reed et al. (1999) study is that it incorporates a wide variety of  
30           contacts that small children have, not just the hand-to-mouth or object-to-mouth. This  
31           information allows assessors to identify areas or surfaces that may serve as sources for toxic

1 constituent transfer. This is especially important for exposure to SVOCs such as pesticides (e.g.,  
2 chlorpyrifos) that have an affinity for absorption onto dust particles, plastic toys, and into the  
3 polyurethane foam (PUF) that is used in many stuffed animals (Gurunathan et al., 1998). Another  
4 strength of this study is the agreement it shows with earlier work by Zartarian et al. (1998) for the  
5 hand to mouth contacts. Some of the shortcomings are the small sample size of the study and the  
6 lack of comment as to the representativeness of the sample population to the U.S. population.  
7 Reed et al. (1999) acknowledge the weakness in regard to the sample size and recommend further  
8 work with a larger population. The study makes no mention of the representativeness of the  
9 sample population or addresses the need for a representative population for any additional study.

10 *Zartarian et al. (1997) - Quantified Dermal Activity Data from a Four-Child Pilot Field*  
11 *Study* - Zartarian et al. (1997) conducted a pilot study of four children of farm workers to  
12 investigate the applicability of using videotaping for gathering information related to children's  
13 interaction with their environment. The evaluation of the videotaping included observation of the  
14 children's contact frequency and duration with objects in their environment, duration spent in  
15 different locations, activity levels, and frequency distributions (Zartarian et al., 1997). As such,  
16 the research was not specifically intended to gather data for non-dietary ingestion; however, the  
17 activities used to evaluate the use of videotaping provide data were for dermal and non-dietary  
18 exposure.

19 Four Mexican-American farm worker children between the ages of 2.5 and 4.2 years were  
20 videotaped for 33 hours using hand-held cameras over the course of a single day in 1993  
21 (Zartarian et al., 1997). Two girls and two boys were the subject of the videotaping. The  
22 videotaping gathered information on detailed micro-activity patterns of children to be used to  
23 evaluate software for videotaped activities and translation training methods (Zartarian et al.,  
24 1997). The data were also reported by type of object/surface and by hand (i.e., left or right).

25 Zartarian et al. (1997) present the data for their observations on a per child and per hand  
26 basis. The data suggest that the U.S. EPA (1997) estimate of hand to mouth contact of 1.56  
27 contacts/hr may significantly underestimate the contacts per hour for young children. None of the  
28 children had average contact frequencies for either hand, individually, lower than 3 contacts/hr for  
29 hand to mouth contact, and Zartarian et al. (1997) estimated the average as 9 contacts/hr. As was  
30 reported by Reed et al. (1999), the most frequently contacted objects were toys and hard (i.e.,  
31 smooth) surfaces (Zartarian et al., 1997). Zartarian et al. (1997) report that the average contact

1 time with objects is only 2 to 3 seconds and that questionnaires and diaries, therefore, would be  
2 insufficient in gathering that level of activity.

3 The Zartarian et al. (1997) study has several weaknesses. The sample population is very  
4 small, only four children; however, the work was reported as a pilot study completely  
5 acknowledging that further work was necessary. The effort was intended to evaluate the  
6 methodology of collecting observations, not the contact data itself. So the data are not presented  
7 in a format that can be used to support other research or supply recommended estimates for  
8 contact frequency. This study may not reflect long-term behavior. In addition, the sample  
9 population is not representative of the U.S. population in general because the sample population  
10 consists of only four Mexican-American farm worker children.

11 *Davis (1995), Soil Ingestion in Children with Pica (Final Report), EPA Cooperative*  
12 *Agreement CR 816334-01* - In 1992, the Fred Hutchinson Cancer Research Center under  
13 Cooperative Agreement with EPA conducted a study to estimate soil intake rates and collect  
14 mouthing behavior data. Originally, the study was designed with two primary purposes: 1) to  
15 describe and quantify the distribution of soil ingestion values in a group of children under the age  
16 of five who exhibit behaviors that would be likely to result in the ingestion of larger than normal  
17 amounts of soil; and 2) to assess and quantify the degree to which soil ingestion varies among  
18 children according to season of the year (summer vs. winter). The study was conducted during  
19 the first four months of 1992 and included 92 children from the Tri-Cities area in Washington  
20 State. These children were volunteers among a group selected through random digit dialing and  
21 their ages ranged between 0 and 48 months. The study was conducted during a period of 7 days.

22 Since there was no standard methodology to study mouthing behavior, a pretest and a  
23 series of pilot studies were conducted to examine various aspects of the methodology. As a  
24 result of the pilot studies, it was determined that although parents could be taught to conduct  
25 observations using the instrument, the resulting ranking of children according to degree of  
26 mouthing behavior did not correspond very well to the rankings based on observations of the  
27 same children by trained staff observers. Therefore, using parents' observations to select a group  
28 with high mouthing activity was not deemed appropriate. Funding constraints made it impractical  
29 to continue with the original design of screening a large number of children and conducting field  
30 work during two different times of the year.



1           The Davis (1995) research recognizes that mouthing behavior is intermittent. Therefore, a  
2 method called “interval method” of observation was used. This method measures both frequency  
3 and duration of the behavior. Under this method, children were observed during 15 second  
4 intervals, during which the mouthing behavior was recorded. Based on the types of behaviors  
5 observed in the testing of the instrument, two mouthing behaviors were selected for the full study.  
6 These included: 1) tongue contacts object; 2) object in mouth. In addition four other behaviors  
7 were included in an attempt to better describe the types of behaviors that would likely result in  
8 soil ingestion: 1) hand touches ground; 2) child repulsed by object in mouth - tries to get it out; 3)  
9 other person stops child’s contact with object; and 4) child out of sight or view. In addition to  
10 further characterize potential exposures to soil associated with the three types of mouthing  
11 behaviors, six object categories were included to be used along with the three mouthing  
12 behaviors. These were: 1) hand, finger, or thumb; 2) other body parts, including toes, feet, arms;  
13 3) natural materials, including dirt, sand, rocks, leaves; 4) toys and other objects, including books,  
14 utensils, keys; 5) surfaces, including, window sills, floor, furniture, carpet; and 6) food or drink.  
15 An additional code was added to indicate whether an object was swallowed by the child. The  
16 type of activity the child was engaged in during the observation period was also recorded. In  
17 addition to mouthing behavior data, Davis (1995) collected information about how long the child  
18 spent indoors and outdoors each day, and the general types of outdoor settings in which the child  
19 played.

20           Mouthing behavior data were collected during a 4-day period. Both trained observers and  
21 one parent observed the children to record mouthing behavior data. Trained observers recorded  
22 mouthing behavior data for 1 hour during active play time, while the parent recorded mouthing  
23 behavior data for the first 15 minutes of that hour.

24           The basic measure of each type of mouthing activity derived from the observation form  
25 was the percent of time spent in that activity. This measure was defined as the percentage of the  
26 total number of intervals observed that indicate such an activity took place. If there was no  
27 activity in an interval, that interval was excluded. For tabulating the object categories, multiple  
28 instances of the same object in a single interval were counted only once in that interval. Multiple  
29 instances of different objects in a single interval were counted separately under each object  
30 category.

1           Based on the mouthing behavior data collected in this study, EPA calculated that during  
2 the period of observation (assumed to be 1 hour) the average mouthing activity was 6.2 minutes  
3 and the average tongue activity was 0.70 minutes. It is important to note that this is based on one  
4 hour of observation. In order to estimate the overall mouthing activity in a day, one would have  
5 to make some assumptions about the amount of time a child is involved in active play time in a  
6 day. These values may also be underestimates because they assume that all the children in the  
7 study were observed for one hour on each of the four days. If this were true, each child would  
8 have a total of 960 intervals of observations (i.e., 3,600 seconds x intervals/15 seconds x 4 days).  
9 The data show that the number of intervals of observation ranged from 80 to 840. It can be  
10 concluded that some children were either observed for less than one hour or less than 4 days.

11           In order to compare the values estimated by Groot et al. (1998) whose work also used  
12 time as a basis for measuring mouthing activity, it is necessary to multiply the Davis (1995) hourly  
13 estimate by an estimate of how long the children are awake during the day. According to Davis  
14 (1995) small children are awake approximately 8.9 hours per day for ages 0 to 48 months. Based  
15 upon this estimate, the Davis (1995) findings translate into about 55 minutes per day of mouthing  
16 activity and 6 minutes per day of tongue activity. The 55 minutes compares favorably to the 37  
17 minutes and 44 minutes estimated by Groot et al. (1998) for 3- to 6-month and 6- to 12-month  
18 old children, respectively, but is significantly above the 16.4 minutes and 9.3 minutes estimated  
19 for the 12- to 18-month and 18- to 36-month old children, respectively.

20           EPA also analyzed the mouthing behavior data for 86 children (43 males/43 females)  
21 from the Davis (1995) study. Six children from the original sample size of 92 were excluded from  
22 the analysis because no age information was provided. Total mouthing behavior included both  
23 mouth and tongue contacts with hands, other body parts, surfaces, natural objects, and toys.  
24 Eating events were excluded from the analysis. Statistical analysis was undertaken to determine if  
25 significant differences existed between age and gender. Model results showed that there were no  
26 associations between mouthing frequency and gender. However, a clear relationship was  
27 observed between mouthing frequency and age. Two distinct groups could be identified:  
28 male/female <24 months and male/female > 24 months. Children <24 months exhibited the  
29 highest frequency of mouthing behavior with  $76 \pm 5$  contacts/hr (n= 30 subjects; 106  
30 observations). On the other hand, children > 24 months exhibited a lower frequency of mouthing

behavior with  $38 \pm 3$  contacts/hr (n= 56 subjects; 192 observations). These results suggest that as children grow older, they are less likely to place objects into their mouths.

The Davis (1995) work has both strengths and weaknesses. The strengths of this work are that it incorporates more children (e.g., 92) in the sample population than any of the other literature reviewed. In addition, the research is very detailed in defining the parameters and variables associated with mouthing behavior. The research also gathered information over four days whereas most of the literature involved only one or two days of observation. Although the research included the largest sample population of the reviewed literature, 92 sample points is still a small number considering the wide variability associated with mouthing in children. The random nature in which the population was selected probably provides a representative population of the northwest U.S., but not the national population in general. The interval time of 15 seconds would also appear to be small and potentially easily skewed for those children observed less than an hour. In addition, most other studies used observation times of 15 minutes to continuous observation throughout waking hours.

### **6.3 RECOMMENDATIONS**

Due to the paucity of the available research data, it is difficult to recommend with any degree of certainty estimates for non-dietary ingestion. Table 6-3 summarizes the studies on mouthing behavior that were described in this chapter. Table 6-4 summarizes the results of these studies. As mentioned earlier, the studies presented use different units of reporting mouthing behavior. If the assessor is interested in estimating exposures during macroactivities, then the total amount of time engaged in mouthing behavior may be the unit of interest. Groot et al. (1998) is the only study thus far that presents data for infants. These data, as well as the Davis (1995) study, show that mouthing behavior decreases as children age. Data from both Groot et al. (1998) and Davis (1995) for children between 3 to 60 months ranged from 9 min/day to 55 min/day with a weighted average of 46 min/day. If the assessor is interested in estimating exposures to various microactivities, then the number of contacts with hands or objects per unit of time may be the unit of interest. Reed et al. (1999) and Zartarian (1997) both studied hand-to-mouth behavior. Although there are uncertainties with the results of these two studies due to sample size, they are fairly consistent in their results. Based on these two studies, a value of 9 contacts/hour seems to be a reasonable estimate of hand-to-mouth behavior. Reed et al. (1999)

1 also studied object-to-mouth frequency. Based on the Reed et al. (1999) and the analysis of the  
2 Davis (1995) data, total mouthing behavior, including hand-to-mouth as well as objects, ranged  
3 from 26 contacts/hour (i.e., 9.5 (hand-to-mouth)+ 16.3 (object-to-mouth)) to 76 contacts/hour  
4 with a weighted average of 45 contacts/hour.

5 The frequency of contact of finger-to-mouth (9.5 contacts/hr) greatly exceeds the 1.56  
6 contacts/hr for fingers to mouth suggested by the U.S. EPA (1997) in their guidance for  
7 calculating exposure to pesticides. The estimate of 9.5 contacts/hr is close to the 9 contacts/hr  
8 estimated by Zartarian et al. (1997) for a study conducted using video taping as reported by Reed  
9 et al. (1999). The agreement of the two studies suggests that the U.S. EPA (1997) value of 1.56  
10 contacts/hr may significantly underestimate the non-dietary exposure route. Table 6-5 presents  
11 the confidence ratings for the recommended values.  
12

## 6.4 REFERENCES FOR CHAPTER 6

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Table 6-1. Extrapolated Total Mouthing Times Minutes per Day (time awake)

Age (months)	No. Children	Mean	Standard Dev.	Minimum	Maximum
3 - 6	5	36.9	19.1	14.5	67
6 - 12	14	44	44.7	2.4	171.5
12 - 18	12	16.4	18.2	0	53.2
18 - 36	11	9.3	9.8	0	30.9

Note: The object most mouthed in all age groups in the fingers except for the 6 - 12 month group which mostly mouthed on toys.

Source: Groot et al. (1998)

Table 6-2. Frequency of Contact, by Contact Variable Contacts per Hour

Variable	Mean	Median	Minimum	Maximum	90 <sup>th</sup> Percentile
Clothing	66.6	65	22.8	129.2	103.3
Dirt	11.4	0.3	0	146.3	56.4
Hand	21.1	14.2	6.3	116.4	43.5
Hand to mouth	9.5	8.5	0.4	25.7	20.1
Object	122.9	118.7	56.2	312	175.8
Object to mouth	16.3	3.6	0	86.2	77.1
Other	82.9	64.3	8.3	243.6	199.6
Smooth surface	83.7	80.2	13.6	190.4	136.9
Textured surface	22.1	16.3	0.2	68.7	52.2

Source: Reed et al. (1999)

Table 6-3. Summary of Studies on Mouthing Behavior

Study	Population Size	Population Studies
Groot et al. 1998	42	3-36 months in Netherlands children from well educated parents
Reed et al. 1999	30	20 children 3-6 years 10 children 2-5 years Day care and residential settings
Zartarian 1997	4	2.5-4.2 years children of farm workers
Davis 1995	92	10-60 months Washington State



Table 6-4. Summary of Mouthing Frequency Data

Age (months)	Mouthing Frequency/Time	Population Size	Reference
3-6	1 min/day	5	Groot et al. 1998
6-12	44 min/day	14	
12-18	16 min/day	12	
18-36	9 min/day	11	
2-6 years	9.5 contacts/hr (hand to mouth) 16.3 contacts/hr (object to mouth)	30	Reed et al. 1999
2.5-4.2 years	9 contacts/hr	4	Zartarian 1997
10-60	55 min/day	92	EPA analysis of
<24	76 $\pm$ 5 contacts/hr	30	Davis 1995
>24	38 $\pm$ 3 contacts/hr	56	

Table 6-5. Confidence in Mouthing Behavior Recommendations

Considerations	Rationale	Rating
<b>Study Elements</b>		
Peer Review	Three of the studies are from peer review journals, one from a contractor's report to EPA	Medium
Accessibility	Studies in journals have wide circulation. Contractor's report only available through EPA	Medium
Reproducibility	Cannot reproduce the data unless raw data are provided.	Medium
Focus on factor of Interest	Studies focused on mouthing behavior as well as other hand contacts.	High
Data pertinent to U.S.	Studies were conducted in the U.S.	High
Primary data	Analyses were done on primary data. EPA did the analysis of the raw data from David et al. 1995.	High
Currency	Recent studies were evaluated	High
Adequacy of data collection period	Data were collected for a period of several days, not enough to represent seasonal variations.	Medium
Validity of Approach	Measurements were made by observation methods. Both surveys and videotaping were used. Videotaping techniques may be more reliable, but resource intensive.	Medium
Representativeness of the population	An effort was made to consider age and gender (in the Davis study), but sample size was too small.	Low
Characterization of variability	An effort was made to consider age and gender, data for infants is fairly limited.	Low
Lack of bias in study design	Subjects were selected from volunteers.	Medium
Measurement error	Measuring children's behavior is difficult and somewhat subjective and depends on the experience of the observer.	Medium
<b>Other Elements</b>		
Number of studies	Four studies were evaluated	Medium
Agreement between researchers	There is general agreement among the researchers.	High
Overall Rating	Although there are four studies, they have very small sample size, variability in the population cannot be assessed. Variation in behavior due to seasons cannot be evaluated. Measuring children's behavior is difficult.	<b>Low/Medium</b>